

**Amendments to the Claims**

This listing of claims will replace all prior versions, and listings, of claims in the application.

These amendments introduce no new matter and support for the amendment is replete throughout the specification and claims as originally filed. These amendments are made without prejudice and are not to be construed as abandonment of the previously claimed subject matter, or agreement with any objection or rejection of record.

**Claim Listing:**

**Claims 1 to 25 (Cancelled)**

**26. (Currently amended)** A composition for tagging objects, comprising:

a population of nanocrystals comprising ~~an excitation spectrum and an emission spectrum, wherein the emission spectrum and at least a portion of the excitation spectrum are in the nonvisible range;~~

~~wherein the population of nanocrystals comprises a mixture of two or more subsets of nanocrystals, the subsets~~ population ~~characterized by a unique spectral code; different excitation wavelengths, and~~

wherein each said subset comprises a plurality of quantum dots of the same size and/or the same composition;

wherein the unique spectral code emissions of the population comprises at least one optical property defined by the interaction of optical properties of at least two of the two or more subsets of nanocrystals, wherein the interaction is other than the excitation wavelength of a first nanocrystal subset exciting a second nanocrystal subset, different wavelengths or different wavelength intensities when alternately excited with the different excitation wavelengths.

**27. (Original)** The composition of claim 26, wherein the nanocrystals comprise: a semiconductor, a nanodot, a nanorod, a nanowire, a nanocrystal, a branched nanorod, a coated nanocrystal, a passivated nanocrystal, or a derivitized nanocrystal.

**28. (Original)** The composition of claim 26, wherein the nanocrystals further comprise a diameter ranging from about 1000 nm to about 0.1 nm.

**29. (Original)** The composition of claim 28, wherein the nanocrystals further comprise a diameter ranging from about 50 nm to about 15 nm.

**30. (Currently amended)** The composition of claim 27, wherein the derivitized nanocrystals comprise a linking agent selected from the group consisting of a substituted silane, a diacetylene, an acrylate, an acrylamide, vinyl, styryl, silicon oxide, boron oxide, phosphorus oxide, N-(3-aminopropyl)3-mercapto-benzamide, 3-aminopropyl-trimethoxysilane, 3-mercaptopropyl-trimethoxysilane, 3-maleimidopropyl-trimethoxysilane, 3-hydrazidopropyl-trimethoxysilane, a hydroxysuccinimide, a maleimide, a haloacetyl, a pyridyl disulfide, a hydrazine, and ethyldiethylamino propylcarbodiimide.

**31. (Currently amended)** The composition of claim 27, wherein the coated nanocrystals comprise an inner core, and a coating layer of semiconductor comprising a band gap greater than that of the core.

**32. (Original)** The composition of claim 31, wherein the nanocrystals comprise AlAs, AlN, AlP, AlSb, CdO, CdS, CdSe, CdTe, GaAs, GaN, GaP, GaS, GaSb, HgO, HgS, HgSe, HgTe, InAs, InN, InP, InSb, MgS, MgSe, ZnO, ZnS, ZnSe, or ZnTe.

**33. (Previously Presented)** The composition of claim 31, wherein the nanocrystals comprise ZnS, ZnSe, ZnTe, CdS, CdSe, CdTe, GaN, GaP, PbTe, HgS, HgSe, HgTe, CdTe, GaAs, GaSb, InP, InAs, InSb, AlS, AlSb, PbS, PbSe, Ge, or Si.

**34. (Currently amended)** The composition of claim 26, wherein the ~~population of nanocrystals comprises two or more subsets of nanocrystals, the subsets comprising~~ comprise different light emission wavelengths.

**35. (Currently amended)** The composition of claim 26, wherein at least one said subset of the population of nanocrystals emits light with a spectral width from less than about 25 nm to about 30 nm.

**36. (Original)** The composition of claim 26, wherein the nanocrystals are manufactured by colloidal synthesis, precipitation, monolayer self assembly,

photolithography, VLS growth, gas-phase nucleation and growth, solution-phase nucleation and growth, or vapor deposition.

**37. (Currently amended)** The composition of claim 26, wherein the unique spectral code of the population comprises an excitation spectrum for the population of nanocrystals comprising ~~comprises~~ ultraviolet, visible, and/or infrared wavelengths.

**Claims 38-39 (Cancelled)**

**40. (Currently amended)** The composition of claim 26, wherein the unique spectral code of the population comprises an emission spectrum for the population of nanocrystals comprising ~~wherein the emission spectrum comprises~~ ultraviolet and/or infrared wavelengths.

**41. (Currently amended)** The composition of claim 26, wherein at least one said ~~the~~ subset of the nanocrystals comprises a predetermined intensity of emission at a certain wavelength.

**42. (Original)** The composition of claim 41, wherein the intensity is predetermined by varying a concentration of a nanocrystal constituent, the presence of an overcoating, or by varying representation of the nanocrystal subset.

**43. (Cancelled)**

**44. (Currently amended)** The composition of claim 26, wherein the ~~population of nanocrystals~~ spectral code comprises a predetermined excitation spectrum or emission spectrum.

**45. (Original)** The composition of claim 44, wherein the spectra are predetermined by varying a size of a nanocrystal, a constituent semiconductor, a size-distribution of the nanocrystals, a composition of a nanocrystal, a polarization of a nanocrystal, or a concentration of a nanocrystal constituent.

**46. (Cancelled)**

**47. (Original)** The composition of claim 26, wherein the composition is excitable or detectable through a barrier.

**48. (Original)** The composition of claim 47, wherein the barrier comprises living tissue, organic tissue, vegetation, animals, smoke, screens, dust, plastics,

clouds, rain, water, a fabric, a material that transmits nonvisible light, or visibly obscured lines of sight.

**Claims 49-59 (Cancelled)**

**60. (Previously presented)** The composition of claim 26, wherein the population of nanocrystals is linked to an adherent matrix, which adherent matrix comprises an affinity molecule or an antibody.

**61. (Previously presented)** An object tagged with the composition of claim 26.

**62. (Currently amended)** The composition of claim 26, wherein the population of nanocrystals ~~is~~ are disposed in or linked to an adherent matrix.

**63. (Previously presented)** The composition of claim 62, wherein the adherent matrix comprises a polymer, a penetrant, a solid support, a glass, a crystal, an organic material, an inorganic material, a liquid tape, a fiber, a patch, a capsule, a powder, a decal, a pin, a clip, a label, ink, or an adhesive.

**64. (New)** The composition of claim 26, wherein the interaction comprises interaction between the emission wavelength of at least the first said subset and the excitation wavelength of at least the second said subset.

**65. (New)** The composition of claim 26, wherein the interaction comprises interaction between the emission frequency of at least the first said subset and the emission frequency of at least the second said subset.

**66. (New)** The composition of claim 26, wherein the interaction comprises interaction between the emission intensity of at least the first said subset and the emission intensity of at least the second said subset.

**67. (New)** A composition for tagging and detecting solid material objects other than molecules, biomolecules, chemical elements, and chemical compounds, comprising:

a population of nanocrystals comprising two or more subsets of nanocrystals that emit light when excited, wherein the population has a unique spectral code, the spectral code comprising the excitation and emission spectra of the population upon excitation with one or more select excitation wavelengths.

**68. (New)** The composition of claim 67, wherein the objects are solid material objects selected from the group consisting of: retail items, manufactured goods, animals, grains, powders, and vehicles.

**69. (New)** A composition for tagging and detecting objects comprising:  
a population of nanocrystals comprising two or more subsets of  
nanocrystals, the population comprising a unique spectral code;

wherein the unique spectral code comprises one or more predetermined  
excitation wavelengths and a corresponding emission profile for the population of  
nanocrystals;

wherein the unique spectral code further comprises one or more excitation  
and/or emission polarization angles.